for examination. The book will be sure to be well used, and we recommend it, and with the authors we hope "that it may stimulate others to make the teaching of physical geography a pleasant exercise for themselves and a valuable mental training for those whom they teach." W.

The Evolution of Photography. (Illustrated.) By John Werge. (London: Piper and Carter; John Werge, 1890.)

IN this work we have a most interesting account, arranged in chronological order, of the origin, progress, and development of the science and art of photography. The author has divided this time into four periods. The first deals broadly with facts bearing on the accidental discovery of photography, and on the early researches and ultimate success of the pioneers. The second embraces a fuller description of their successes and results, while the third is devoted to the consideration of patents and impediments, and the fourth to the final development of both photographic literature and art.

Although the author has not entered minutely into elaborate details of each process, yet he has given enough to form an interesting summary. Excellent illustrations of some of the chief photographic investigators, taken from paintings, daguerreotypes, &c., and reproduced by the callotype process, add greatly to the value of the book.

Following this there is a chronological record of inventions, discoveries, publications, and appliances connected with the development of photography, and the author concludes with the personal reminiscences, extending over a period of forty years.

This book will be an acceptable addition to our photographic literature, and will be found interesting not only by the practical photographer, but by many amateurs. W.

Geometrical Drawing for Art Students. By I. H. Morris. (London: Longmans, Green, and Co., 1890.)

ART students will be glad to find in this work a compendium of those parts of geometry which cover the necessary range for their course. Plane geometry and its applications, the use of scales, and the plans and elevations of solids, are treated concisely, and the method adopted throughout of placing the text on the left-hand pages, leaving the right-hand pages solely for figures, will be found most convenient. The figures are all neat and well drawn, those illustrating the problems on solid geometry being especially so.

The chapter on the construction and use of plain and diagonal scales and scales of chords, subjects which are generally stumbling-blocks to a great many students, is made very clear, and in chapter xv. good ideas are imparted in the applications of geometry to the construction of patterns and simple tracing.

Nearly six hundred figures are inserted in the book, together with a complete and exhaustive collection of exercises. Students interested in this subject other than those for whom the work is intended will find the arrangement adopted more convenient than in many other books on the subject. W.

An Elementary Text-book of Dynamics and Hydrostatics. By R. H. Pinkerton, B.A. Oxon. Second Edition. (London: Blackie and Son, Limited, 1890.)

WE are glad to see the appearance of a second edition of this serviceable little text-book, the first edition of which we reviewed some time ago. No material alteration has been made in any part of the work. The appendix has been extended by the introduction of the method of co-ordinates, the discussion of simple harmonic motion and its application to the pendulum, and the method of finding moments of inertia.

Several new examples have been fully worked out for the purposes of illustrating the methods of solving problems graphically, and some additional examination papers have been given.

At the beginning of the book tables of relative density and of the English and French measures will be found, and the work concludes with a newly added index. We can only repeat what we said formerly, that this is a book to be thoroughly recommended. W.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Pilcomayo Expedition.

IN view of the notice in the *Times* this week of the collapse of the Pilcomayo Expedition, the inclosed extract from a home letter of Mr. J. Graham Kerr, Naturalist with the Expedition, may be of sufficient interest for publication in NATURE. The letter was received in Scotland on September 2. It contains no mention of Captain Page, and must have been written before his death as recorded in the *Times*. The letter bears out the *Times* account of the difficulties encountered by the Expedition, and that the Pilcomayo is not likely to become a trade water-way; but it does not foreshadow disaster such as the *Times* account suggests, and it gives hope that the other members of the Expedition may not have shared the fate of Captain Page. ISAAC BAYLEY BALFOUR.

September 27.

"*s.s. 'Bolivia,' Rio Pilcomayo, lat.* 24° 25′ *S., long.* 58° 40′ *W.,*
"*Tuesday, June* 3, 1890.

"We entered the Pilcomayo on March 12, therefore we have been 3 months on the river. We have managed to penetrate about 300 miles by river in that time, but owing to the extraordinary tortuosity of the Pilcomayo, our distance in a straight line from Asuncion I don't suppose is more than, if it reaches, 100 miles. The river is very disappointing from the points of view of æsthetics, botany, zoology, geology, and anthropology. As regards the first, the scenery in the lower reaches is certainly beautiful, but of a type of beauty which soon palls upon one, and becomes intensely monotonous. The scenery is very much that of a sluggish flowing river at home. When we first entered the river, I was amazed at its small size—only about 50 yards in width. Up here it seldom reaches 20 yards, and is frequently not more than 10, and there is scarcely any water in it at all. For the last two months we have got forward not more than 10 leagues, at the very outside, and what little we have done has been by building dams, letting the water accumulate, and so getting forward for a short distance, when another dam was built, and so on. The larger steamer, the *General Paz*, we had to leave far down the river. The military detachment whom we had left a few miles down was discovered the other day to have flown, their provisions, no doubt, having run short. We brought a corporal and two men on with us. The other day, however, one of these deserted, and has, no doubt, either gone over to the Indians or been killed by them. To return, however, to the scenery. Here, and for a long distance down, we have had a type of scenery which is to be found in very few parts of the world—that of an immense palm forest, covering thousands of square miles. It consists typically of a perfectly level plain clothed with breast-high grass, over which are closely studded palm-trees with large fan-shaped leaves; all around, far as the eye can reach, an interminable vista of palm-trees, varied only by an occasional clump of brushwood, or near the river by a small patch of forest. In no way is the aspect of nature suggestive of the tropics here, *i.e.* when one has got over the first impression induced by the palm-trees. The Gran Chaco is in fact an immense wilderness. Large game occurs only in small numbers. I have managed to get only a couple of peccaries, and no one else has shot any large game. I have not even got a tiger yet, and have only once had anything approaching an adventure with one. Other adventures we have had absolutely none. Intense monotony and uninterestingness are the chief characteristics of the river. Botanically speaking, it is

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an absolute desert. In an ordinary summer's afternoon walk at home one sees more species of plants in flower than I have seen since we entered the river. . . . However, this may improve, as it is now the dead of winter here, and with the advent of spring I hope to see many new and interesting flowers appear. Zoologically, too, it is disappointing, except in the case of birds. In the lower parts of the river not a bird was to be seen, but now they are rather more frequent, and I have already observed 116 species, of which I believe about 30 have not before been collected in Argentina. Owing to the desert nature of this part of the Chaco, its human inhabitants are very few, scattered, and nomadic. We have not seen a single Indian or canoe on the Pilcomayo. But we know they are about, for nearly every day we see their great fires for hunting all around us, and we occasionally come across a chipped palm, or the remains of an old *tolda*, the rude shelter which serves them as a tent; now and again, too, we see a human footprint, sometimes of immense size, impressed upon the muddy margin of a lagoon. So we are always on the alert, the four Britons of the Expedition keeping watch at night, fully armed and wide awake. The four said Britons are Poole, Kenyon (English), Henderson the chief engineer, and myself. When I go away collecting also, as I every day, I always go with loaded revolver and knife—ready for emergencies. For in addition to Indians there are abundance of tigers about, which one has to be prepared for. Yesterday we got an alligator close to the boat, 8 feet long. The alligators here are all small, 8 feet being the largest we have seen. . . .

"As regards food we are on very short rations, being within a month or so of the end of our provisions. The canoe is to be sent down soon, I believe, to hurry up the fresh supplies of provisions, and by it I shall send this letter, although it is very doubtful whether you will ever get it. The health of the men is not good; we have always two or three of the 17 on board ill. I have, however, had excellent health. The only thing disagreeable is the fearful cold. In the mornings the thermometer is often nearly at freezing-point, and I feel quite benumbed. Fortunately, it generally gets a little warmer during the day, the temperature rising in the afternoon to between 70° and 90° F. The river-water is regular brine here, quite as salt as sea-water, and when occasionally we run out of fresh water for a few days, it is very disagreeable having to take coffee, &c., made with the salt water. Of fruits here, there are none worth eating. The young parts of the palm-trees are eatable, and we use a good deal of it in order to economize the rice, &c. I don't expect at all that we can possibly reach Bolivia, and I don't think the river could ever be made navigable."

Protective Colours.

MR. POULTON, in his book entitled "The Colours of Animals," seeking a reason for the glistening metallic colours of many chrysalides, after showing that the colour is probably protective in its origin, states "that it has arisen from the protective resemblance to rough dark surfaces of rocks."

He comes to this conclusion after failing to find other more probable examples of glistening bodies in nature.

Are such not, however, very common (i.) in the slime or mucous covering many of the Invertebrata, and which snails and slugs leave on all surfaces over which they have passed; (ii.) the webs of spiders and their allies, especially if moist; (iii.) the exudation or excretion of many plants; (iv.) decomposing bodies; (v.) the bark of many trees?

Perhaps the commonest places to find glistening chrysalides are on palings, tree trunks, and various plants; all of which structures are usually resplendent with one or more of the above metallic hues, and among which the chrysalides are very hard to find.

May not these more common objects be those of attempted resemblance, rather than the less frequent pieces of broken rock?

Grosvenor Club, Bond Street, W. WALTER K. SIBLEY.

MR. SIBLEY'S letter appears to me to contain valuable suggestions as to the meaning of the metallic appearance of certain chrysalides. It is probable that a resemblance to the objects he suggests does aid in concealing the pupæ. Mr. Roland Trimen has similarly concluded that certain brilliant beetles (*Cassididæ*) are protected by resembling drops of dew. At the same time I think that there is some evidence that the metallic appearance of the pupæ of *Vanessidæ* may have been originally acquired in order to favour concealment against glittering mineral surfaces. The evidence is as follows:—(1) In shape and character of the surface these pupæ strongly resemble a rough and broken piece of rock. (2) They appear in two forms, resembling grey and weathered as well as freshly exposed and glittering rock surfaces. (3) When they seek green leaves for pupation they either conceal themselves with the greatest care (*V. atalanta*), or a glittering variety of other species is represented by a green variety which is inconspicuous against the leaves (*V. Io*). (4) Another species (*V. urticæ*), which lacks the habit of *V. atalanta* and the green variety of *V. Io*, is, as far as my experience goes, very rarely found on the leaves of its food-plant, and when so found, is, as a rule, diseased.

I mention the chief lines of evidence upon which I have relied in order to show that it was not merely the failure "to find other more probable examples of glittering bodies in nature" which led me to adopt the view alluded to by Mr. Sibley. Although I still consider that my hypothesis is probable, at any rate for the *Vanessidæ*, I am convinced that the resemblance to other glittering objects, such as those mentioned by Mr. Sibley, has favoured the development and especially the persistence of the metallic appearance. E. B. POULTON.

September 19.

The Aryan Cradle-land.

"IT will be for the benefit of our science," said the President of the Anthropological Section of the British Association, "that speculations as to the origin and home of the Aryan family should be rife; but it will still more conduce to our eventual knowledge of this most interesting question if it be consistently borne in mind that they are but speculations." With the latter, no less than with the former opinion, I cordially agree. And as, in my address on the Aryan cradle-land, in the Anthropological Section, I stated a greater variety of grounds in support of the hypothesis of origin in the Russian steppes than has been elsewhere set forth, I trust that I may be allowed briefly to formulate these reasons, and submit them to discussion.

(1) The Aryans, on our first historical knowledge of them, are in two widely separated centres, Transoxiana and Thrace. To Transoxiana as a secondary centre of dispersion the Eastern Aryans, and to Thrace as a secondary centre of dispersion the Western Aryans, can, with more or less clear evidence, or probable inference, be traced, from about the fourteenth or perhaps fifteenth century B.C.; and the mid-region north-west of Transoxiana and north-east of Thrace—and which may be more definitely described as lying between the Caspian and the Euxine, the Ural and the Dnieper, and extending from the forty-fifth to the fiftieth parallel of latitude—suggests itself as a probable primary centre of origin and dispersion.

(2) For the second set of facts to be considered reveal earlier white races from which, if the Aryans originated in this region, they might naturally have descended as a hybrid variety. Such are the facts which connect the Finns of the north, the Khirgiz and Turkomans of the east, and the Alarodians of the south, with that non-Semitic and non-Aryan white stock which have been called by some Allophyllian, but which, borrowing a term recently introduced into geology, may, I think, be preferably termed Archaian; and the facts which make it probable that these white races have from time immemorial met and mingled in the South Russian steppes. Nor, in this connection, must the facts be neglected which make great environmental changes probable in this region at a period possibly synchronous with that of Aryan origins.

(3) In the physical conditions of the steppes characterizing the region above defined, there were, and indeed are to this day, as has been especially shown by Dr. Schrader, the conditions necessary for such pastoral tribes as their language shows that the Aryans primitively were; while, in the regions between the Dnieper and the Carpathians, and between the Oxus and the Himalayas, the Aryans would, both in their south-western and south-eastern migrations, be at once compelled and invited, by the physical conditions encountered, to pass at least partially from the pastoral into the agricultural stage.

(4) The Aryan languages present such indications of hybridity as would correspond with such racial intermixture as that supposed; and in the contemporary language of the Finnic groups Prof. de Lacouperie thinks that we may detect survivals of a former language presenting affinities with the general characteristics of Aryan speech.

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